

immediately prior to the end of each emission sampling period.

(l) Fresh impingers shall be installed in the methanol collection system immediately prior to the end of each emission measurement, if applicable.

(m) The end of the first, second, and third emission sampling period shall occur 1440 ± 6 , 2880 ± 6 , 4320 ± 6 minutes, respectively, after the beginning of the initial sampling, as specified in paragraph (i)(5) of this section.

(1) At the end of each emission sampling period, analyze the enclosure atmosphere for hydrocarbons and record. This is the final hydrocarbon concentration, C_{HCF} , required in § 86.1243. The emission measurement at the end of each period becomes the initial hydrocarbon concentration, C_{HCI} , of the next emission sampling period.

(2) Analyze the enclosure atmosphere for methanol, if applicable, and record. The methanol sampling must start simultaneously with the initiation of the hydrocarbon analysis and continue for 4.0 ± 0.5 minutes. This is the final (time=1440 minutes) methanol concentration, C_{CH_3OH} , required in § 86.1243. Record the time elapsed during this analysis. If the 4-minute sample period is inadequate to collect a sample of sufficient concentration to allow accurate GC analysis, rapidly collect the methanol sample in a bag and then bubble the bag sample through the impingers at the specified flow rate. The time elapsed between collection of the bag sample and flow through the impingers should be minimized to prevent any losses. If the test is conducted in a fixed-volume enclosure that allows airflow into and out of the enclosure, the effect of makeup air dilution must be factored into the analysis.

(n) At the end of the temperature cycling period the enclosure doors shall be unsealed and opened, the test vehicle windows and luggage compartments may be closed and the test vehicle, with the engine shut off, shall be removed from the enclosure.

(o) This completes the full three-diurnal evaporative emission test sequence described in § 86.1230-96.

(p) For the supplemental two-diurnal test sequence described in § 86.1230-96, the following steps shall be performed

in lieu of the steps described in paragraphs (b) through (n) of this section.

(1) For the supplemental two-diurnal test sequence, the test vehicle shall be soaked for not less than 6 hours nor more than 36 hours between the end of the hot soak test described in § 86.1238-96(k), and the start of the two-diurnal emission test. For at least the last 6 hours of this period, the vehicle shall be soaked at 72 ± 3 °F.

(2) The vehicle shall be tested for diurnal emissions according to the procedures specified in paragraphs (c) through (n) of this section, except that the test includes only two 24-hour periods. Therefore the end of the first and second emission sampling periods shall occur 1440 ± 6 and 2880 ± 6 minutes, respectively, after the initial sampling.

(3) This completes the supplemental two-diurnal test sequence for evaporative emission measurement.

[58 FR 16057, Mar. 24, 1993; 59 FR 48524, Sept. 21, 1994, as amended at 60 FR 43905, Aug. 23, 1995]

§ 86.1234-96 Running loss test.

(a) *Overview.* Gasoline- and methanol-fueled vehicles are to be tested for running loss emissions during simulated high-temperature urban driving; this test is not required for gaseous-fueled vehicles. During operation, tank temperatures are controlled according to a prescribed profile to simulate in-use conditions. If the vehicle is determined to have exceeded the standard before the end of the running loss test, the test may be terminated without invalidating the data. The test can be run either in a sealed enclosure or with the point-source method, as specified in paragraph (g) of this section. Measurement of vapor temperature is optional during the running loss test; however, if testing by the Administrator shows that a vehicle has exceeded an emission standard without measurement of vapor temperatures, the manufacturer may, utilizing its own resources, conduct subsequent testing on that vehicle to determine if the exceedance is attributable to inadequate control of vapor temperatures.

(b) *Driving schedule.* Conduct the running loss test by operating the test vehicle through three Heavy-Duty Vehicle Urban Dynamometer Driving

Schedules (see § 86.1215 and appendix I of this part). Fifteen seconds after the engine starts, place the transmission in gear. Twenty seconds after the engine starts, begin the initial vehicle acceleration of the driving schedule. The transmission shall be operated according to the specifications of § 86.1228 during the driving cycles.

(c) *Dynamometer operation.* (1) The exhaust from the vehicle must be routed outside the test cell or enclosure. Exhaust gases may, but need not, be collected and sampled.

(2) Provisions of § 86.1235-85(c) shall apply.

(3) Practice runs over the prescribed driving schedule may not be performed at test point.

(4) Provisions of § 86.1235-85 (e) and (f) shall apply.

(5) If the dynamometer horsepower must be adjusted manually, it shall be set within 1 hour prior to the running loss test phase. The test vehicle shall not be used to make this adjustment. Dynamometers using automatic control of preselectable power settings may be set any time prior to the beginning of the emissions test.

(6) Dynamometer roll or shaft revolutions shall be used to determine the actual driving distance for the running loss test, D_{RL} , required in § 86.1243. The revolutions shall be measured on the same roll or shaft used for measuring the vehicle's speed.

(7) Provisions of § 86.1235-85(i) shall apply.

(8) The test run may be stopped if a warning light or gauge indicates that the vehicle's engine coolant has overheated.

(d) *Engine starting and restarting.* (1) Provisions of § 86.1236-85(a) shall apply.

(2) If the vehicle does not start after the manufacturer's recommended cranking time (or 10 continuous seconds in the absence of a manufacturer's recommendation), cranking shall cease for the period recommended by the manufacturer (or 10 seconds in the absence of a manufacturer's recommendation). This may be repeated for up to three start attempts. If the vehicle does not start after three attempts, the reason for failure to start shall be determined. If failure to start is an operational error, the vehicle shall be

rescheduled for testing, starting with the soak period immediately preceding the running loss test.

(3) If failure to start is caused by a vehicle malfunction, corrective action of less than 30 minutes duration may be taken (according to § 86.090-25), and the test continued, provided that the ambient conditions to which the vehicle is exposed are maintained at 95 ± 5 °F (35 ± 3 °C). When the engine starts, the timing sequence of the driving schedule shall begin. If failure to start is caused by vehicle malfunction and the vehicle cannot be started, the test shall be voided, the vehicle removed from the dynamometer, and corrective action may be taken according to § 86.090-25. The reason for the malfunction (if determined) and the corrective action taken shall be reported to the Administrator.

(4) Provisions of § 86.1236-85(b) shall apply.

(e) *Pressure checks.* No pressure checks of the evaporative system shall be allowed. Under no circumstances will any changes/repairs to the evaporative emissions control system be allowed.

(f) *Temperature stabilization.* Immediately after the hot transient exhaust emission test, the vehicle shall be soaked in a temperature controlled area for a maximum of 6 hours until the fuel temperature is stabilized. The fuel may be heated or cooled to stabilize fuel temperatures, but the fuel heating rate must not exceed 5 °F in any 1-hour interval during the soak period. A manufacturer may use a faster heating rate or a longer period for stabilizing fuel temperatures if the needed heating cannot be easily accomplished in the 6-hour period, subject to Administrator approval.

(1) Fuel temperatures must be held at 95 ± 3 °F for at least one hour before the start of the running loss test.

(2) If a vehicle's fuel temperature profile has an initial temperature lower than 95 °F, as described in § 86.1229-85(d)(7)(v), the fuel in the test vehicle must be stabilized to within 3 °F of that temperature for at least one hour before the start of the running loss test.

(g) *Running loss test.* The running loss test may be conducted either by the

enclosure method, or by the point-source method.

(1) *Enclosure method.* (i) The running loss enclosure shall be purged for several minutes immediately prior to the test. WARNING: If at any time the concentration of hydrocarbons, of methanol, or of methanol and hydrocarbons exceeds 15,000 ppm C the enclosure should be immediately purged. This concentration provides at least a 4:1 safety factor against the lean flammability limit.

(ii) The FID hydrocarbon analyzer shall be zeroed and spanned immediately prior to the test.

(iii) If not already on, the running loss enclosure mixing fan(s) shall be turned on at this time. Throughout the test, the mixing fan(s) shall circulate the air at a rate of at least 1.0 cfm per cubic foot of ambient volume.

(iv) The test vehicle, with the engine off, shall be moved onto the dynamometer in the running loss enclosure. The vehicle engine compartment cover shall be unlatched, but closed as much as possible, allowing for the air intake equipment specified in paragraph (g)(1)(vii) of this section. The vehicle engine compartment cover may be closed if alternate routing is found for the air intake equipment. Any windows, doors, and luggage compartments shall be closed. A window may be opened to direct cooling air into the passenger compartment of the vehicle, if the vehicle is not equipped with its own air conditioning.

(v) Fans shall be positioned as described in §§ 86.1207-96 (d) and (h).

(vi) The vehicle air conditioning system (if so equipped) shall be set to the "normal" air conditioning mode and adjusted to the minimum discharge air temperature and high fan speed. Vehicles equipped with automatic temperature controlled air conditioning systems shall be set to operate in "automatic" temperature and fan modes with the system set at 72 °F.

(vii) Connect the air intake equipment to the vehicle, if applicable. This connection shall be made to minimize leakage.

(viii) The temperature and pressure recording systems shall be started. Measurement of vapor temperature is optional during the running loss test.

If vapor temperature is not measured, fuel tank pressure need not be measured.

(ix) Turn off purge blowers (if not already off).

(x) The temperature of the liquid fuel shall be monitored and recorded at least every 15 seconds with the temperature recording system specified in § 86.1207-96(e).

(xi) Close and seal the enclosure doors.

(xii) When the ambient temperature is 95 ± 5 °F (35 ± 3 °C) and the fuel has been stabilized according to paragraph (f) of this section, the running loss test may begin. Measure the initial ambient temperature and pressure.

(A) Analyze enclosure atmosphere for hydrocarbons and record. This is the initial (time=0 minutes) hydrocarbon concentration, C_{HCi} , required in § 86.1243. Hydrocarbon emissions may be sampled continuously during the test period.

(B) Analyze the enclosure atmosphere for methanol, if applicable, and record. The methanol sampling must start simultaneously with the initiation of the hydrocarbon analysis and continue for 4.0 ± 0.5 minutes. This is the initial (time=0 minutes) methanol concentration, $C_{CH_3OH_i}$, required in § 86.1243. Record the time elapsed during this analysis. If the 4-minute sample period is inadequate to collect a sample of sufficient concentration to allow accurate GC analysis, rapidly collect the methanol sample in a bag and then bubble the bag sample through the impingers at the specified flow rate. The time elapsed between collection of the bag sample and flow through the impingers should be minimized to prevent any losses.

(xiii) Start the engine and begin operation of the vehicle over the drive cycle specified in paragraph (b) of this section.

(xiv) The ambient temperature shall be maintained at 95 ± 5 °F (95 ± 2 °F on average) during the running loss test, measured at the inlet to the cooling fan in front of the vehicle; it shall be recorded at least every 60 seconds.

(xv) The fuel temperature during the dynamometer drive shall be controlled to match the fuel tank temperature

profile determined in § 86.1229. Measured fuel temperatures must be within ± 3 °F of the target profile throughout the test run. Vapor temperatures, if measured, must be within ± 5 °F of the target profile during the first 4186 seconds of the running loss test, and within ± 3 °F for the remaining 120 seconds of the test run. For any vehicle complying with the test standards, vapor temperatures may be higher than the specified tolerances without invalidating test results. For testing by the Administrator, vapor temperatures may be lower than the specified tolerances without invalidating test results. If the test vehicle has more than one fuel tank, the temperatures for both fuel tanks shall follow the target profiles determined in § 86.1229. The control system shall be tuned and operated to provide smooth and continuous tank temperature profiles that are representative of the on-road profiles.

(xvi) Tank pressure shall not exceed 10 inches of water at any time during the running loss test unless a pressurized system is used and the manufacturer demonstrates that vapor would not be vented to the atmosphere upon fuel cap removal. A vehicle may exceed the pressure limit for temporary periods during the running loss test, up to 10 percent of the total driving time, provided that the vehicle has demonstrated conformance with the pressure limit during the entire outdoor driving period specified in § 86.1229. Measurement of fuel tank pressures will be considered valid only if vapor temperatures are measured and controlled to the tolerances specified in paragraph (g)(1)(xv) of this section.

(xvii) The FID (or HFID) hydrocarbon analyzer shall be zeroed and spanned immediately prior to the end of the test.

(xviii) Fresh impingers shall be installed in the methanol collection system immediately prior to the end of the test, if applicable.

(xix) The running loss test ends with the completion of the third 2-minute idle period.

(xx) At the end of the running loss test:

(A) Analyze the enclosure atmosphere for hydrocarbons and record. This is the final hydrocarbon concentration, C_{HCG} , required in § 86.1243.

(B) Analyze the enclosure atmosphere for methanol, if applicable, and record. The methanol sampling must start prior to the end of the test and continue for 4.0 ± 0.5 minutes. The methanol sampling must be completed within 2 minutes after the end of the running loss test. This is the final methanol concentration, C_{CH_3OHf} , required in § 86.1243. Record the time elapsed during this analysis. If the 4-minute sample period is inadequate to collect a sample of sufficient concentration to allow accurate GC analysis, rapidly collect the methanol sample in a bag and then bubble the bag sample through the impingers at the specified flow rate. The time elapsed between collection of the bag sample and flow through the impingers should be minimized to prevent any losses.

(C) Turn off all the fans specified in § 86.1207-96(d). Also, the time that the vehicle's engine compartment cover is open for removal of air intake equipment, if applicable, shall be minimized to avoid loss of heat from the engine compartment.

(xxi) Turn off any CVS apparatus (if not already turned off).

(2) *Point-source method.* (i) The test vehicle, with the engine off, shall be moved onto the dynamometer. The vehicle engine compartment cover and any windows, doors, and luggage compartments shall be closed.

(ii) Fans shall be positioned as described in §§ 86.1235-85(b) and 86.1207-96(d).

(iii) The running loss vapor vent collection system shall be properly positioned at the potential fuel vapor vents or leaks of the vehicle's fuel system. Typical vapor vents for current fuel systems are the ports of the evaporative emission canister and the pressure relief vent of the fuel tank (typically integrated into the fuel tank cap).

(iv) The running loss vapor vent collection system may be connected to a PDP-CVS or CFV-CVS bag collection system. Otherwise, running loss vapors shall be sampled continuously with analyzers meeting the requirements of § 86.1207-96(b).

(v) Fans shall be positioned as described in § 86.1207-96(d).

(vi) The vehicle air conditioning system (if so equipped) shall be set to the "normal" air conditioning mode and adjusted to the minimum discharge air temperature and high fan speed. Vehicles equipped with automatic temperature controlled air conditioning systems shall be set to operate in "automatic" temperature and fan modes with the system set at 72 °F.

(vii) The temperature and pressure recording systems shall be started. Measurement of vapor temperature is optional during the running loss test. If vapor temperature is not measured, fuel tank pressure need not be measured.

(viii) The temperature of the liquid fuel shall be monitored and recorded at least every 15 seconds with the temperature recording system specified in § 86.1207-96(e).

(ix) When the ambient temperature is 95 ± 5 °F (35 ± 3 °C) and the fuel tank temperature is 95 ± 3 °F the running loss test may begin.

(x) The ambient temperature shall be maintained at 95 ± 5 °F (95 ± 2 °F on average) during the running loss test, measured at the inlet to the cooling fan in front of the vehicle; it shall be recorded at least every 60 seconds.

(xi) Fuel temperatures shall be controlled according to the specifications of paragraph (g)(1)(xv) of this section.

(xii) The tank pressure requirements described in paragraph (g)(1)(xvi) of this section apply also to running loss testing by the point source method.

(xiii) The running loss test ends with completion of the third 2-minute idle period.

(xiv) If emissions are collected in bags, the sample bags must be analyzed within 20 minutes of their respective sample collection phases, as described in § 86.137-94(b)(15). The results of the analysis are used in § 86.1243 to calculate the mass of hydrocarbons emitted.

(xv) At the end of the running loss test, turn off all the fans specified in § 86.1207-96(d).

(h) Following the completion of the running loss drive, the vehicle may be

tested for hot soak emissions as specified in § 86.1238-96.

[58 FR 16059, Mar. 24, 1993, as amended at 59 FR 48524, Sept. 21, 1994; 60 FR 43905, Aug. 23, 1995]

§ 86.1235-85 Dynamometer procedure.

(a) The dynamometer run consists of one HDV urban dynamometer driving schedule cycle starting within one hour after completion of the diurnal loss test. This run includes engine startup (with all accessories turned off) and operation over the driving schedule.

(b) During dynamometer operation, one or more cooling fans shall be positioned so as to direct cooling air to the vehicle in an appropriate manner. The engine compartment cover shall be closed. If, however, the manufacturer can show that the engine compartment cover must be open to provide a test representative of field operation, the Administrator will allow the engine cover to be open. In the case of vehicles with front engine compartments, the fan(s) shall be squarely positioned within 12 inches of the vehicle. In the case of vehicles with rear engine compartments (or if special designs make the above impractical), the cooling fan(s) shall be placed in a position to provide sufficient air to maintain vehicle cooling. The fan capacity shall normally not exceed 10,600 (cfm ($5.0 \text{ m}^3/\text{s}$)). If, however, the manufacturer can show that during field operation the vehicle receives additional cooling, and that such additional cooling is needed to provide a representative test, the fan capacity may be increased or additional fans used.

(c) The vehicle speed as measured from the dynamometer rolls shall be used.

(d) Practice runs over the prescribed driving schedule may be performed at test points, provided emissions are not measured, for the purpose of finding the minimum throttle action to maintain the proper speed-time relationship, or to permit test procedure adjustments.

NOTE: When using two-roll dynamometers a truer speed-time trace may be obtained by minimizing the rocking of the vehicle in the rolls. The rocking of the vehicle changes the tire rolling radius on each roll. This rocking